FERNANDEZ-LOPEZ, S., Facultad Ciencias Geoloógicas, Spain

Role of Taphonomy in Biostratigraphic and Evolutionary Interpretations

During this century, paleontologists have given so much importance to paleobiological and biostratigraphical problems that subjects which are related to the "origin and nature of the fossils" seem to have lost its earlier significance. Generally, fossils and fossilization have been treated respectively as states and processes suffered by organisms, pollen, or any type of organic material from the past. This has reached such an extreme that fossils are presupposed to be of organic nature, that fossilization consists of the transition from the living to the fossil state, and that paleobiological entities of different organization level (organisms, populations, communities, ecosystems, etc.) suffered the same transition. These presuppositions, however, are not justified by the so-called theory of the organic origin of fossils, by the theory of organic evolution, by the recent advances of the ecological theory. Moreover, the term *fossil* has been applied to many different entities, due to the diversity of presuppositions in use.

Taphonomy pretends to ascertain the processes and modifications suffered by the fossil record. Although taphonomy is only a conceptual subsystem of paleontology, it has its own concepts that allow us to dissociate the fossil record from the geological or stratigraphic record; it is also possible to consider fossils (or recorded-entities) and corresponding organisms (or paleobiological entities) as entities of distinct nature. The aim of taphonomical studies are the fossils, the recorded-entities, and not the fossiliferous strata or the paleobiological entities. The taphonomical data are necessary for paleobiological interpretations (paleoecological, paleobiogeographic, and/or evolutionary), and are relevant in applied paleontology (biostratigraphy, ecostratigraphy, etc.) and other scientific disciplines such as sedimentology and paleogeography. But, taking into account various logical and epistemological presuppositions that are presently used in biology and paleontology, it is necessary to use and develop a dynamistic and systemistic conception of the fossils (Fernandez López, 1981-1988). The identification of integrated systems with taphonomical-paleobiological relationships allow us to raise and solve some actual problems in paleontology. This conception may contribute to the development of a theory on fossilization, without being incompatible with the presuppositions on the theory on organic evolution. It may also serve to enlarge the base of the evolution theory, and it may favor the congruence among the different conceptual subsystems in paleontology. From a methodological point of view, this conception may contribute to increase the possibilities to analyze and synthesize taphonomical research, and it enables a more variate contrast of the paleontological hypotheses, which are of interest in life and earth sciences.

The problem of interpreting temporal relations among rock bodies through a phylogenetical hypothesis, which in turn is based on stratigraphical interpretations, may be solved if the paleontological or biochronological reference framework is justified by taphonomical-paleoecological interpretations of the fossils and corresponding paleobiological entities. This is also valid for the description of biological evolution with respect to a stratigraphic scale, which in turn is based on a interpretation of biological evolution. The biostratigraphic system is based on the fossil contents of the rock bodies, and not on the paleobiological (faunistic or floral) remains; in the latter case, it would implicitly admit that fossils are paleobiological entities that changed their state, and this would be incompatible with the concepts of evolutionary taphonomy. In general, the present state of taphonomical knowledge allows us to distinguish among: (1) fossiliferous strata that form part of, or constitute, a stratigraphical succession (i.e., biostratigraphical succession), (2) recorded-associations in successive stratigraphical levels (recorded succession), (3) recorded-associations that are topologically successive; each of these associations belongs to a rock body different from, or common to, the others (registratic succession). Parting from the relational concept of a biostratigraphic, registratic, or paleobiological succession, one could obtain a concept of successional class that allows one to establish concrete biostratigraphical, registratical, or paleobiological units, respectively. Each of these units is to be controlled by means of relative data concerning occurred taphonomical changes. In order to obtain a biochronological standard framework, it is only necessary to evidence and classify systematically into units the different kinds of successive topologically recorded-entities. But we should, however, take into account the time of production and fossilization to such an extent that the established units correspond to successive temporal intervals. These units were defined as "cronoregistros" and "taxorregistros" (Fernández, 1986, 1987). The "cronorregistros" are recorded-entities that are produced during a specific geological time interval. The "taxorregistros" are recorded-entities that are taxonomically to be characterized, independently of their production and fossilization time. From the moment that each of these temporally successive units is established, it is possible to determine the temporal relations among different paleobiological entities, and to attribute any recorded or paleobiological entities to some age. The relations between "taxorregistros" and "cronorregistros" are analogous to those between biozones and chronozones, or between biozones and standard zones. Each chronozone may be represented by more than one type of biozone, and each "cronorregistro" may be demonstrated by different "taxorregistros," even in the same locality. But, in one locality or in a particular area, there may exist "cronorregistros" or "taxorregistros" to which not any stratigraphic unit may correspond (neither chronozone, nor any biozone). All these concepts are not incompatible or contradictory to those in biostratigraphy and chronostratigraphy, but on the contrary they may serve as a new base to amplify their fundamentation.